

# Taximeter Standards and Testing

## INTRODUCTION

In many cities, taximeter testing is conducted by weights and measures officials. Some taxicab regulators may be unfamiliar with the standards used by these officials to test and approve taximeters. In this presentation, I will discuss how taximeters are tested and where the standards come from.

## TAXIMETER STANDARDS

Taximeters are commercial measuring devices that are regulated by state and local weights and measures programs. The weights and measures programs in most states reside in the Department of Agriculture. Each state, and many county or city jurisdictions, adopts a weights and measures code into law. Most use model law developed by the National Conference on Weights and Measures (NCWM). The NCWM is a standards setting organization of weights and measures officials that has as a principal goal to promote uniform regulation of weights and measures. Weights and measures programs include a variety of inspection activities from testing commercial weighing and measuring devices (e.g., scales, gas pumps, taximeters) to checking packages (e.g., net contents, labeling, price scanning).

The National Institute of Standards and Technology (NIST) in the U. S. Department of Commerce publishes the handbooks of the NCWM. NIST Handbook 44 *Specifications, Tolerances, and Other Technical Requirements for Commercial Weighing and Measuring Devices* includes the national standards for taximeters at Section 5.54 [attached]. The standard is presented in four sections:

- Specifications (S)
- Test Procedures (N)
- Tolerances (T)
- User Requirements (UR)

**Specifications.** This section of the standard describes the design requirements for the construction and operation of taximeters. Topics include:

- visibility of indications
  - fare constantly displayed
  - easily read by passenger at a distance of 4 feet (1.2m)
- actuation of fare-indicating mechanism
  - distance when taxi is at speeds where distance revenue exceeds time revenue
  - time when taxi speed is less or taxi is stopped

e.g.,

$$\frac{\$.50 \text{ per min.} \times 60 \text{ min. per hr.}}{\$1.80 \text{ per mile}} = \frac{\$30.00 \text{ per hr.}}{\$1.80 \text{ per mile}} = 17 \text{ mph}$$

speed at which distance rate = time rate

speeds > 17 mph = fare indicator actuated by distance travelled  
 speeds < 17 mph = fare indicator actuated by time elapsed

One purpose of the wait time/slow speed rate (< 17 mph) is to protect drivers because they lease taxicabs by time (e.g., 12 hour shift). Another purpose is to encourage drivers to provide service during peak traffic periods or at events where traffic congestion reduces distance revenue sharply.

- extras
  - means to totalize extras
  - display must return to separate indications within 5 sec.
- recorded representation (printed receipt)
  - taxi number
  - date, start/end times for trip
  - distance travelled (max. increments of 0.1 mi.)

- extra charges itemized, total fare

All information but date and fare are nonretroactive requirements adopted by the 84<sup>th</sup> National Conference on Weights and Measures during July 25-29, 1999 in Burlington, VT. The italic print mean that the item is nonretroactive or existing taximeters are grandfathered. The purpose is to prevent unnecessary hardship on industry. [See voting item 354-1 which proposed a nonretroactive revision to S.1.9].

- security seals
  - means of sealing (e.g., wire and lead seal)
  - prevent access to adjustment mechanism
- power interruptions
  - fare and extra indications return to previous display after power interruption of 3 sec. or less
  - return to previous display but no advance if more than 3 sec. Must clear taximeter.

Currently, 44 states have adopted the National Type Evaluation Program (NTEP) of the NCWM [see map]. In NTEP states, all new installations of taximeters must have a certificate of conformance (CC). The CC is evidence that the taximeter meets the specification and tolerance requirements contained in NIST Handbook 44. [see example of CC]

The NCWM administers the NTEP program and lists CC on its web site and in NCWM Publication 5 (series) *NTEP Index of Device Evaluations*. Under the NTEP program, manufacturers submit prototype taximeters to designated state metrology labs for testing. The NCWM issues the CC.

### **Test Procedures (Notes).**

- distance test method
  - road test - measured course
  - fifth-wheel test - independently measures and indicates distance
  - simulated road test - roller equipment

e.g.,

$$\frac{5,280 \text{ feet per mile}}{2.33 \text{ feet per revolution}} = 1,864 \text{ revolutions per mile}$$

(circumference of roller)

< 1845 rev. = overregistration (taximeter fast)

> 1939 rev. = underregistration (taximeter slow)

Weights and measures officials use various forms to document taximeter tests (see example). A taximeter that doesn't meet allowed tolerances is rejected and cannot be used until it is repaired and retested. Operation of a taxicab without a sealed taximeter often subjects the violator to civil or criminal prosecution.

- distance test procedures
  - length of test - 3<sup>rd</sup> money drop or 1 mile
  - speed of vehicle - above crossover speed so timing mechanism is not activated
- vehicle lading
  - 2 persons
- tire pressure
  - operating pressure posted on door plate

At a lower tire pressure, the circumference of the tire is less so fewer roller revolutions are recorded and taximeter will underregister actual distance travelled (taximeter is slow).

- time test procedure
  - initial plus 4 time intervals

### **Tolerances.**

Service technicians are supposed to adjust taximeters so that there are not errors. However, weights and measures officials allow small tolerances during tests.

- distance tests

- 1% on overregistration (taximeter is fast)
- 4% on underregistration (taximeter is slow)

### **User Requirements.**

- position of taximeter
  - conveniently read by passenger in back seat
- statement of rate
  - distance rates, time rates, and extras conspicuously displayed inside front and rear passenger compartments
  - local tax rate

### **CONCLUDING REMARKS**

Taxi regulators should become familiar with taximeter standards contained in NIST Handbook 44 and NTEP requirements adopted into state weights and measures codes or rules. It is helpful to observe weights and measures officials testing taximeters.

The IATR should submit comments on taximeter voting items under consideration by the NCWM.

Taximeter fraud is a growing problem. It is a big problem with all electronic weighing and measures devices and especially those containing computers (e.g., gas pump meters, electronic scales). There are several types of "zappers" used by dishonest taxicab drivers to inject extra pulses into the sensor line and thereby overcharge passengers. A recent article on types of zappers and anti-zapper technology is:

Claude Ricard and Michel Le Faou. "Taximeters - Solutions to Combat Fraud" OIML Bulletin Vol. XLI No. 2 April 2000 pp. 9-14 [attached]

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